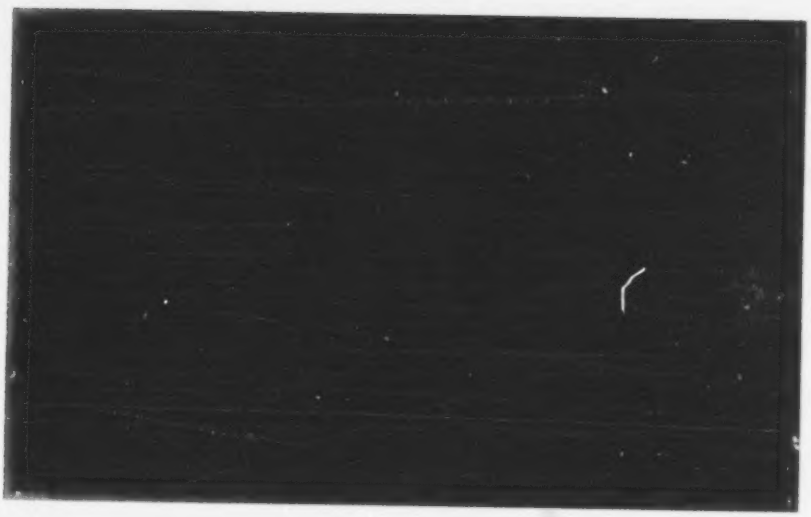
CENTRE DE RECHERCHE SUR LES TRANSPORTS
(C.R.T.)
CENTRE FOR RESEARCH ON TRANSPORTATION

UNIVERSITÉ DE MONTRÉAL
ÉCOLE DES HAUTES ÉTUDES COMMERCIALES
ÉCOLE POLYTECHNIQUE



CENTRE DE RECHERCHE SUR LES TRANSPORTS
UNIVERSITÉ DE MONTRÉAL
C.P. 6128, SUCCURSALE A,
MONTRÉAL
CANADA H3C 3J7

TÉLÉPHONE: (514) 343-7575
TÉLEX: 05-24146 BIBPOLYTEC
EMAIL: crt@crt.umontreal.ca
TÉLÉCOPIEUR (FAX): (514) 343-7121

To appear in Journal of Oriental Studies.

CRT-728

THE CANADIAN FORELAND OF CHINESE PORTS

by

Claude Comtois*
François Soulard*
Jean-Paul Rodrigue*

* Département de géographie, Centre d'études de l'Asie de l'Est et Centre de recherche sur les transports, Université de Montréal, C.P. 6128, succursale A, Montréal (Québec) H3C 3J7.

Centre de recherche sur les transports - Publication #728

October 1990

91-00961/

Dépôt légal - 4e trimestre 1990

ABSTRACT

The notion of foreland is multidimensional, more so than the hinterland. The foreland is both a maritime and terrestrial space. Depending on commercial specialization, products, frequencies of contact, the notion of foreland will be modified. The purpose of this paper is to present a new methodology to aggregate spatial patterns of maritime transport at a world scale from micro scale information about maritime flow of goods. The methodology will be applied to evaluate the mutations of international trade on Chinese port activities in the light of a few key propositions: 1) the conditions of contemporary traffic have several consequences on the organization of Chinese port infrastructures; 2) Chinese port development policies cannot solely concentrate on internal factors but also on a few external factors, such as the regional policies and transport infrastructure development strategies in trading partner countries; 3) containers offer a more continuous foreland, by extending the zone of influence of major harbours in a more important manner than freight in bulk which is more punctual or clustered. The article investigates the Canadian forelands of Chinese ports. First, we will analyze how location factors affect interaction patterns resulting in methodology presentation. The contemporary aspects of Canadian and Chinese ports will then be studied. The impact of the entry of China into the world economic market on maritime transport is then examined. This is followed by an analysis of the Sino-Canadian seaborne trade. The investment policy implications notably in the maritime transport sector is then evaluated.

Key words: Foreland, maritime transportation, port, China, Canada.

RÉSUMÉ

La notion d'avant-pays est multidimensionnelle, beaucoup plus que celle d'arrière-pays. L'avant-pays est à la fois un espace maritime et terrestre. La notion d'avant-pays se modifie avec la spécialisation commerciale, les types de produits, et la fréquence de contact. L'objectif est de présenter une nouvelle méthodologie pour agréger les configurations spatiales du transport maritime à l'échelle mondiale à partir d'informations à micro-échelle sur le flux de biens maritimes. La méthodologie sera appliquée pour évaluer les impacts des mutations du commerce international sur les activités portuaires chinoises à la lumière de quelques propositions clés: 1) les conditions du trafic contemporain ont nombre de conséquences sur le développement des infrastructures portuaires; 2) les politiques chinoises de développement portuaire ne doivent pas seulement se concentrer sur des facteurs internes mais aussi sur quelques facteurs externes tels que les politiques régionales et les stratégies de développement des infrastructures de transport des pays partenaires commerciaux; 3) les conteneurs offrent un avant-pays plus continu, en étendant la zone d'influence des principaux ports d'une façon plus importante que ne le permet le transport des marchandises en vrac dont le parcours est plus simple. L'article cherchera à examiner l'avant-pays canadien des ports chinois. Nous analyserons d'abord comment les facteurs de localisation affectent les modèles d'interaction ce qui résultera en une présentation méthodologique. Les aspects contemporains des ports chinois et canadiens seront ensuite examinés. Ceci sera suivi d'une analyse de l'impact sur le transport maritime de l'entrée de la Chine au marché économique mondial. Nous évaluerons ensuite le commerce maritime sino-canadien. L'article concluera sur une analyse des implications possibles sur les politiques d'investissement, notamment dans le secteur des transports maritimes.

Mots-clés: Avant-pays, transport maritime, port, Chine, Canada.

THE CANADIAN FORELAND OF CHINESE PORTS

1. THE RESEARCH PROBLEM

Maritime transport and international trade are intertwined in their development. Three elements characterized the recent evolution of world exchanges.

Firstly, a greater division of production compelled by the ageing of industrial infrastructures brought a profound transformation in the functioning conditions of the international economic system. The most important change resides in the reduction of the use of raw material in the production of goods and energy. The systematic search for energy saving in all fields of economic activities has accelerated the substitution of information for raw material, energy and labor power. All heavy industries around the world have been concerned especially those depending on international trade and exchange. Indeed, the international division of labor does not give to countries producing raw material and energy and having an important reserve of poorly qualified labor power the advantage of a capacity to innovate in the most evolved form of industries.

Secondly, certain practices related to the physical circulation of goods are now emerging. Without generalizing, major maritime carriers are having difficulties on several transit line or in specialized cargo. As a result, these carriers integrate in their strategies the modifications of the world economic environment by progressively offering new international maritime transport services that take into consideration the specificity of markets. These carriers acquire their own autonomy and are capable of anticipating the expectations of freight partners (Stanley, 1978; Stromme, 1978).

Thirdly, the world market tends to fragment the labor process in two ways. On the one hand, a disintegration of production characterized by an increase in subcontracting is observed. On the other hand, the international division of capital operates through a tangling of functions in various countries often within the same firm. The logic of the general production mode is realized at a world scale, while the logic of the functioning of national territorial units is itself often dependent on particular cultural circumstances. Hence a profound discrepancy between two rhythms. There is a new form of dependency of national territories toward industries: not on the territorial planning demands of a few enterprises, but on the domination of each national territorial system by a world market logic of multinational firms (Armstrong and McGee, 1985).

One of the consequences of these tendencies on the organization of industrial space is the fundamental role played by ports with regards to international exchanges. But, the pressing need of the production rhythm and logic finds its root at the world level and as such is foreign to national port systems. As a result, the reorganization of maritime transport leads to extremely complex operations given the diversity and heterogeneity of actors.

Ports by themselves do not increase national trade (Bird, 1986, p.160). Port activities are a response to the interdependence of water and land transport systems. Nevertheless, maritime transport on which rest the major

currents of world traffic often exercises a determining action on spatial organization. The Chinese port system is of major importance for the country for two reasons: the growing importance of external trade in the development of the economy, and the geographic location of the country. This resulted in 1988, in that approximately 178 million tons of imported goods penetrated by maritime transport and that exported merchandises by ports represented over 212 million tons of the traffic (China Statistics Monthly, 1989). The very few studies conducted on the chinese port system, have concentrated on Chinese port hinterland (Leung, 1981; Comtois, 1989). But in the study of the geography of Chinese ports, one of the most important element is the size and economy of forelands.

The notion of foreland is multidimensional, more so than the hinterland. The foreland is both a maritime and terrestrial space (Marcadon, 1986, p. 55). Depending on commercial specialization, products, frequencies of contact, the notion of foreland will be modified. Measurement of the importance of flows between two countries is made easier by the existence of precise account of the flows of exchanges by type, value and geographical origin or destination of the products concerned. Evaluation becomes more complicated when the available amount of data is scarce, and published statistics are relatively difficult to obtain (Li, 1962; Chen, 1967, 1975). In the following pages the intention is to present a new methodology to aggregate spatial patterns of maritime transport at a world scale from micro scale information about maritime goods flow.

The objective of the paper is to evaluate the impacts of the mutations of international trade on Chinese port activities in the light of a few key propositions: 1) the conditions of contemporary traffic have several consequences on the development of port infrastructures; 2) Canada offers an excellent illustration of a foreland in transformation; 3) Chinese port development policies must not solely concentrate on internal factors but also on a few external factors such as the regional policies and transport infrastructure development strategies in trading partner countries; 4) containers offer a more continuous foreland, by extending the zone of influence of major harbors in a more important manner than freight in bulk which is more punctual or clustered.

The present paper will investigate how location factors affect interaction patterns resulting in methodology presentation. The contemporary aspects of Canadian and Chinese ports is then examined. This will be followed by an analysis of the impact of the entry of China into the world economic market on maritime transport. We will then evaluate the Canadian forelands of Chinese ports. The paper will conclude by an analysis of the investment policy implications, notably in the maritime transport sector.

2. TERRITORIAL RELATIONSHIPS AND METHODOLOGICAL CONSIDERATION

The persistent factors of location, links and accumulation characterizing ports must be viewed as a system reflecting the emerging reality of a new economic order.

Firstly, all port locations are relative. There are no isolated ports. Ports are important or not, central or peripheral in relation to other ports. Ports continue to exist or grow on the condition that they are well located in

relation to other ports and industrial infrastructures. The success of a location depends on links with the hinterland and the foreland.

Secondly, any change occurring in one port will affect ports that are linked to it. The impact will depend on the type of change and on the type of flow. If a new seaborne route is created, the importance of ports linked with that route will change. The effect on ports will range from positive to negative depending on flow and distances.

Thirdly, ports are fixed places. The territorial factors linked with the influence of history, the location of resources, population densities render inequality of access practically inevitable. Under these conditions territorial development not only contributes to the fixity of ports but reinforces inequalities of access.

A common theme frequently shared in transport geography is the fundamental role of seaports as the essential transport infrastructure designed to integrate land and sea transport networks. The basic consideration involves the concept of interdependence between foreland and hinterland. Ports reflect the demands made upon their services from a wide variety of sources in the hinterland and the foreland. An analysis of Chinese seaports in the context of regional economic development requires an emphasis upon the interdependence of port throughput and the character of port forelands, for throughput is basically a function of foreland production and demand; and the economic geography of forelands provides partial explanation of the structure and character of port external throughput.

Following the remarkable contribution of Alexandersson and Norstrom (1963), Berry (1966), Bird (1969), Yeates (1969), Charlier (1986), Van den Bremen (1986) and Hoare (1988), the intention is to explore the interdependence between the geography of city-ports and the geography of flow.

The concept of foreland is fundamental to an understanding of the rapid development in the maritime transport sector. To make the model as simple as possible,

Let j be a country.

Let i be a foreland port of country j.

Let T_{ij} be a portion of the total seaborne trade of country j being handled at port i.

Let P(i) be the set of ports located in the same country as port i.

We want to determine how close the contribution of a foreland port to the hinterland is to the contribution of the hinterland to the foreland port.

We define

$$FI = \sum_j \sum_i \left[\frac{T_{ij}}{\sum_i T_{ij}} \times \frac{\sum_{i \in P(i)} T_{ij}}{\sum_j T_{ij}} \right] = 1$$

where the foreland index (FI) expresses the ratio of a foreland port throughput between the hinterland and the foreland to the total seaborne trade of the hinterland, multiplied by the total seaborne trade between the hinterland and the foreland to the total foreland port throughput.

Regionally, the index ranges from 0 to 1. Ideally, such coefficients should be calculated for all hinterlands and all forelands, or for all forelands of a given hinterland.

All cargo tonnes handled at Canadian ports in international seaborne shipping, by handling port, commodity and origin or destination were surveyed in 1987. Data representing China seaborne trade were clearly identified.

In the equation, we consider j as China and i as a Canadian port.

The Canadian foreland index of China (FI) was calculated from:

1. the total quantity of tonnes handled for China at each Canadian port (T_{ij});
2. the total seaborne trade of China $\sum_i T_{ij}$;
3. the total seaborne trade between China and Canada $\sum_{i \in P(i)} T_{ij}$;
4. the total Canadian port throughput $\sum_j T_{ij}$.

3. CONTEMPORARY ASPECTS OF CANADIAN AND CHINESE PORTS

In recent years, the internationalization of exchanges, notably the North American economic integration with the implementation of the Free Trade Agreement between United States and Canada have had an impact on the transformation of Canadian ports (Tessier and Dulude, 1987). There is now a shift in emphasis in Canadian ports towards the development of intermodality and interconnectivity. Intermodality demands a fast and efficient throughput of commodities. A port must offer both production related activities and an integrated centre of distribution. The Canadian economy has a low potential for interior market development, hence the objective of Canadian firms to establish important relations with foreign economies. The resulting territorial interconnectivity, demands that the modal split at break-up load points, be highly integrated within the North American urban system. Both concepts determine the level of competitivity of ports and point to the

importance of container handling capacity.

Container handling represents a major shift in Canadian port operations. In 1986, international container traffic at Halifax, Montréal and Vancouver accounted for 82%, 82% and 39% respectively (Bisson, 1987). These figures indicate that the Canadian east coast ports are more adapted to container traffic than their western counterparts which send out much bulk materials. The North American economy is still concentrated eastbound, but more importantly the North American east coast urban system is well served with the rail network. This means that a container load handled at Montréal can be easily conveyed to multiple points of destination in North America through rail transport. The recent economic perspective of the Asia Pacific market however tends to shift the emphasis of territorial development towards the western coast of the continent. Indeed, it is likely that capacity will soon be reached at Canadian west coast ports since it is more economical to ship Canadian grain for example through Pacific than Atlantic ports (McCalla, 1989). Given the production and consumption patterns of the Asia Pacific Rim, the rationale for major infrastructural changes in road, rail and water transport on the Canadian pacific front, is well in place.

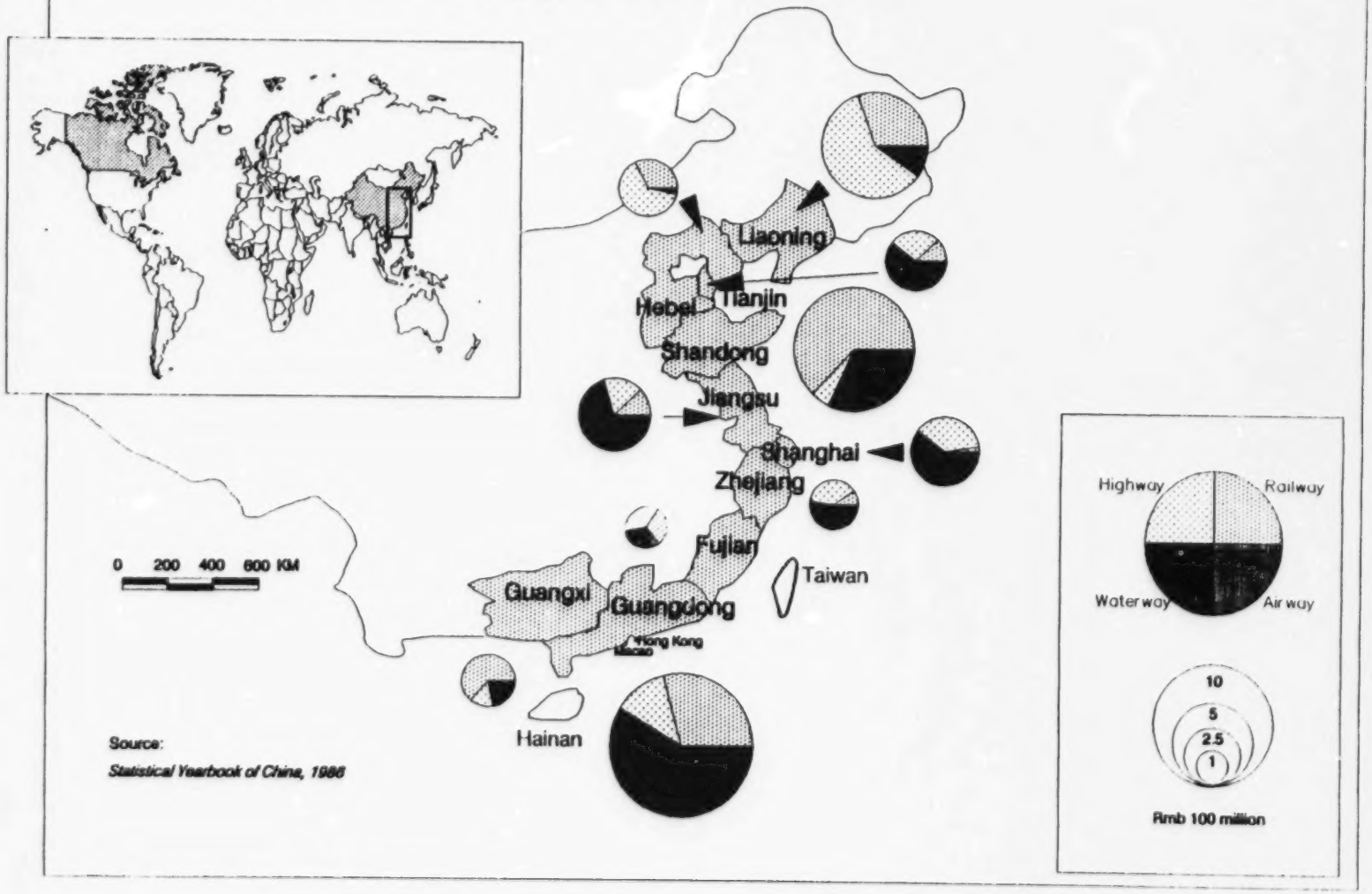
The contemporary development of the world economic market is increasingly influenced by the growing participation of East and Southeast Asian nations. The strong growth of the gross national product and of consumption needs of these countries, implies that attention must be paid to the infrastructural changes in regional production and distribution modes. Since 1978, the evolution of China's national transportation system has been closely related to the modernization of productive forces and production relations induced with the implementation of economic reforms (Leung and Comtois, 1983). Indeed, these changes coincide with the institution of new economic and territorial management policies that promote the exchanges of goods, people and services (Croll, 1988; Delfs, 1986; Goldberg, 1987; White, 1987; Wong, 1988). As a result, the analysis of China's portuary development and the evolution of China's foreland must consider the interrelationship between the state transport investment policies and the economic advantages resulting from the opening of China to the world economic market.

With the adoption of the fifth five-year plan (1976-1981), China has promoted it's reintegration to the world economic market with a view to accelerate China's quest for production modernization. Obviously, the economic benefits and technological know-how resulting from growing participation into world exchanges, must be supported by adequate capital accumulation in the transport sector. Such a strategy can easily be illustrated in the development of the Chinese port system. In 1985, the capital investment in transport infrastructure was largely dominated by the three coastal provinces of Liaoning (Rmb 815 000 000), Shandong (Rmb 1 006 000 000) and Guangdong (Rmb 1 542 000 000). The value of investment related to the implementation of the special economic zones in Guangdong, added to the strategic location of the province within the Pacific Rim transport system, might explain the privileged position of Guangdong as a focus of state capital investment since 1978 (Statistical Yearbook of China, 1981; Statistical Yearbook of China, 1988).

The analysis of capital investment distribution in the transport sector demonstrates that Guangdong has the largest share of investment in water transport (Map 1). Indeed, the value of state investments for the development

MAP 1

Investment in Capital Construction in the Transport Sector by mode for the Coastal Provinces of China, 1985



Source:
Statistical Yearbook of China, 1986

of the water transport sector in Guangdong, evaluated at Rmb 759 000 000, largely dominates that of any other provinces in China. This strategy of territorial planning not only reflects the need to enhance the inherent structure of international trade, but also marks the will of Chinese authorities to achieve an equitable territorial development along the coastal areas. Indeed, Map 2 reveals that the harbor infrastructures of the provinces of Northeast China take up an important share of international trade benefits. Most of China's foreign currency penetration essentially concentrates in central China focussed on Shanghai which is at the heart of the water transport system of China.

The southern provinces have been reorientating their local economies towards the promotion of light industries (Pannel, 1988; Rabushka, 1987). China's territorial planning reforms, the proximity of Taiwan, the return of Hong Kong to China in 1997, as well as the developing international division of labor, have favored this recent trend of industrialization in southern China. A trend that also characterized the newly industrialized countries of East and Southeast Asia (Maurer and Regnier, 1989). The impact of growing economic opportunities from the emerging new world trade patterns is affecting the development of China's coastal provinces transport system.

4. THE TRANSFORMATION OF PORT FUNCTIONS AND DEVELOPMENT

The integration of China's economy to the world market has contributed to underline the prevailing role of water transport in international exchange. Exchanges of seaborne goods within the Pacific Rim which represented some 11% of the world total of maritime transport in 1972, has reached 19% in 1985. Commodities that were transported out of the Pacific Rim that accounted for approximately 3% of world sea transport in 1970, reached 6% in 1985; while commodities transported to the Pacific area remained constant at 14% over the same period. Transportation outside the Pacific Rim area diminished from 72% in 1970 to 62% in 1985 (Van den Bremen, 1988). These figures would tend to corroborate the growing participation of China in the world sea transportation of goods.

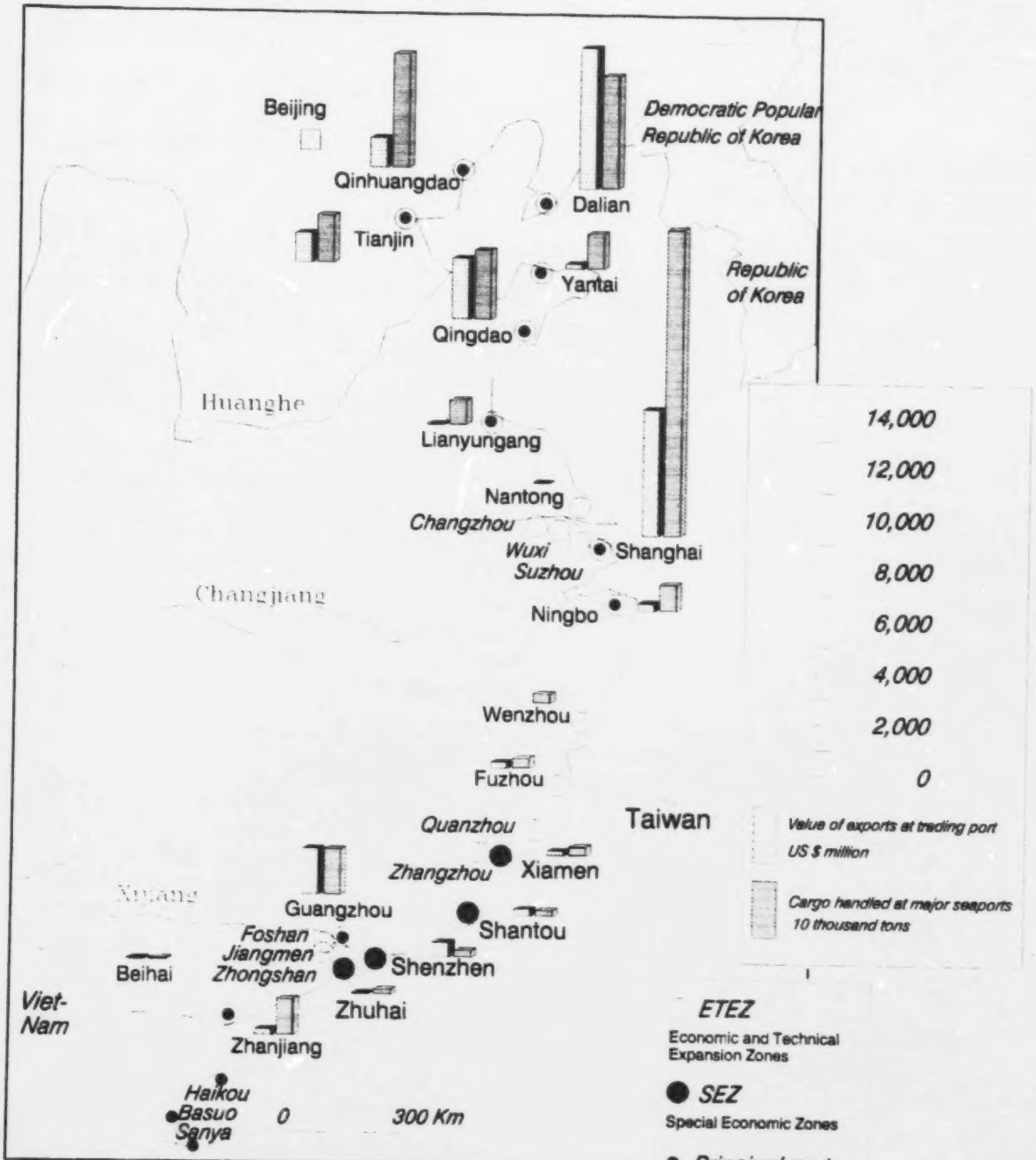
The growth of port traffic through the 15 principal Chinese seaports is summarized in table 1. The growth in port throughput since 1978 reflects the economic opening of China to foreign trade. The average annual growth rate during the period 1978-1987 is 7.04%. The largest growth is in foreign trade rather than domestic or coastal traffic. Indeed, the figures in table 1 reveal that while the dependency of China's economy to the world market is small, it has more than doubled during the same period. Chinese ports are evolving under the pressure of a number of factors affecting the relationships between port functions, and inter-port competition. The development of ports is influenced by internal, external and locational factors.

4.1 Internal factors

The enlargement of maritime space to reach further forelands appears as a stategic element of first importance. The share of international transport in the global volume of transport grows with the level of penetration of external trade, and China must make choices with regards to long term transport infrastructures of Chinese interest.

MAP 2

Cargo Handled and Value of Exports at Selected Ports in China, 1985



Sources:

Statistical Yearbook of China, 1986

Wang and Bradbury, 1986

TABLE 1

SELECTED INDICATORS FOR CHINA'S EXTERNAL TRADE

Year	Cargo handled at principal seaports (10 000 t)	Index of dependency %
1952	1 440	3.2
1957	3 727	3.3
1965	7 181	2.2
1978	19 834	2.6
1981	21 931	4.0
1982	23 764	3.9
1983	24 952	3.9
1984	27 549	4.6
1985	31 154	6.2
1986	34 409	6.8
1987	36 610	6.7

Note: Index of dependency is defined as the total amount of foreign trade divided by twice the total product of society.

Source: Statistical Yearbook of China 1984; Statistical Yearbook of China 1986; Statistical Yearbook of China 1988.

Table 2 reveals several aspects of investment and production decisions on China's maritime transport. There are constant gains in output/labor, while the output/capital measure indicates an average annual decrease rate of -3.54% between 1965 and 1975, with a small acceleration in the rate of increase since 1975. These figures point to changes in productivity over time. There is no doubt that productivity has improved on China's ocean shipping since 1965, but there is a clear distinction between labor and capital productivity. China's ocean merchant marine grew spectacularly over the past years. Indeed, there seems to have been major efforts to substitute capital for labor. The 1987 capital/labor ratio is virtually 13 times the 1965 ratio. This would suggest that even though China has committed important investments on equipment and technology improvements, the rapid growth in foreign trade has placed considerable strain on Chinese water transport which cannot keep up with growing demand and have thus to rely of seaport infrastructures which are more labor intensive. Moreover, freight intensity is decreasing since 1980. This would suggest that as the Chinese economy diversifies, a smaller proportion of heavy industrial products is carried on ocean-going ships, and that major efforts have been made to process raw materials which reduces transport intensity. Coal, petroleum, timber, iron ore and copper which are transported in huge quantities are the object for pre-transport treatment. Weight-reducing processing done at the source of raw materials saves several million tons of transport per year. The figures also imply that the average distance for ocean-going ship has increased since 1965, reflecting the need to trade with more distant partners.

4.2 External factors

This decade has been marked by the introduction of new production and a greater division of production compelled by the ageing of industrial infrastructures and the abandoning of inert mechanical technology and its substitution by robotisation. From a geographical point of view, a new territorial structure is emerging. Port development in highly developed countries puts into question the existing urban structures. The extent and speed of maritime transport system and the size of investments to realize are the reflection of a reorganization of regions whose size increases sensibly, establishing a new hierarchy of urban centres founded on the fusion of transport stations, highway interchange, international or regional airports, as well as seaports into major regional economic agglomeration. International activities are presented as the necessary complement of national traffic. The interdependence of economies create the interdependence of flows through political frontiers. The growth of international traffic within and between regional economic bloc is increasing significantly. Given the size of transport investment to be realized, trading partners consider undertaking transportation investments as a group rather than alone. Cooperation between countries appears a necessity. Such multinational transportation investments are beneficial to all participating ports, in addition to furthering economic cooperation, enhancing territorial integration, and bringing valuable economies of scale.

4.3 Location factors

Ocean-going traffic demand forecasts for China foresee a continued expansion of maritime transport activities. This increase in demand will necessitate new water transport vehicles, and new operation techniques not only because the volumes will grow but rather because there is an evolution in the type of cargo transported. This alteration in the nature of cargo however

TABLE 2

SELECTED INDICATORS OF CHINA'S OCEAN SHIPPING

Year	Output/Labor	Output/Capital	Capital/Labor	Output/GNP
1965	77 320.6	62 368.4	1.240	.106
1970	106 631.0	55 866.7	1.909	.133
1975	333 439.6	43 490.1	7.667	.393
1980	537 138.9	44 596.0	12.045	.499
1985	722 889.9	51 051.1	14.160	.399
1987	830 693.2	48 759.7	17.036	.355

Note: Output is defined as freight ton-kilometers. Labor is an estimate of the number of staff and workers in state-owned units in waterway transport and harbor services (0.82% of the total number of staff and workers in state-owned units). Capital is the deadweight tonnage of ocean going merchant ships. Data for 1985 and 1987 were estimated at 10 438 560 and 13 486 540 dwt respectively. GNP is the gross output value of agriculture and industry.

Source: Comtois, 1989; Statistical Yearbook of China 1981; Statistical Yearbook of China 1984; Statistical Yearbook of China 1988

will not change the need for supplying an adequate maritime transport infrastructure. But the new international division of labor will reduce the relative weight of Chinese ports in basic production and increase its participation in container traffic, warehousing and distribution functions. The liberalization of heavy products and the reduction of finished products costs give great flexibility in the location of industries. Distribution and commercial functions are now a priority.

The industrial changes annonce the end of major industrial zones concentration inherited from the past. The size of their ascendancy, the rigidity of their infrastructures, have imposed constraints isolating certains sectors, favoring unequal territorial development. The Chinese authorities are contemplating the introduction of high technology industries along the coastal areas. But the creation of major harbor complex whose accessibility is progressively adapting itself to the needs of the world maritime transport system coupled with the establishment of industrial units upstream leading to major operations of territorial planning, is highly questionable. The pursuit of Chinese water transport construction in spite of its difficulties and slowness, must consider abolishing the rigidity of harbor infrastructures that prevent the development of long term structural adaptations. Indeed, the development of telecommunication system will bring forward a new spatial form redistributing port functions, and reducing, through better communication, the need for physical movement of goods.

These factors have lead to an increase in the necessity of transportation services improvement, a growth in cost at distribution centers and a reduction of long distance transport cost characterized by the establishment of specialized transportation services, and marked by a clear division in the circulation of goods, people and services. More insight may be gained by examining the Sino-Canadian seaborne shipping.

5. SEA TRANSPORT DEMAND AND THE SINO-CANADIAN TRADE

Among important changes in the world after 1980 influencing Sino-Canadian trade, we may single out the following:

- an internationalization of China's economy as measured by the increase share of foreign trade into the gross national product;

- a regionalization of trade as a result of an increase participation of less developed countries in China's trade and of the Free Trade Agreement between the United States and Canada;

- an increase in energy cost affecting the number and the frequency of port of call;

- the impact of transport deregulation on sea carriers;

- the increase in the amount of containerized tonnage.

General cargo accounted for over 99% of the China-Canada seaborne trade handled, loaded or unloaded at canadian ports in 1987, while containers represented less than 1%. Table 3 reveals that the bilateral seaborne trade balance is overwhelmingly in Canada's favour. In 1987, seaborne exports from

TABLE 3

THE CHINA-CANADA SEABORNE TRADE AT CANADIAN PORTS, 1987

Products	Inbound (tons)	Outbound (tons)
Food and agricultural products		
Live animals		38
Vegetable products		6 268 502
Animal and vegetable fats and oils		3 976
Prepared foodstuffs	187	33
Minerals and chemicals		
Mineral products	26 478	1 122 064
Chemical products	16 001	214 856
Plastics		58
Wood products		
Wood		345 893
Pulp of wood, paper and paperboard		407 935
Textiles	15 334	147
Metals and manufactured products		
Metals and articles of base metals	26 934	45 199
Machinery and equipment	63	11 437
Transport equipment		2 138
Miscellaneous manufactured articles	33	1 694
TOTAL	85 030	8 423 970

Source: Statistics Canada, 1989.

China to Canada barely exceeded 1% of Canadian exports of merchandise to China. Trade with China accounts for approximately 1% of Canada's trade, while China's share of Canada's trade is more important at the 5 percent level. The important difference in commodity structure between imports and exports of general cargo between Canada and China may be an important element influencing port distribution of general cargo flows. A detailed examination of seaborne trade is required for the analysis of demand for shipping and port services.

5.1 China's imports

Food and agricultural products is by far the leading subgroup by weight in Chinese imports from Canada. A significant share of current Canadian exports going to China is cereals. This indicates that the pattern of Sino-Canadian trade has not been drastically altered for the past two decades (Ho and Huenemann, 1972). The second most important commodity group is minerals where potassium accounts for a predominant share of China's imports for its chemical fertilizer industry. Finally, given the limited domestic chinese supplies, Chinese imports of Canadian wood and wood by-products remains important.

5.2 Canada's imports

Canadian imports from China in 1987 has been dominated by mineral products, light manufactured goods and textiles. The market profile of the Canadian imports from China is essentially composed of the traditional concentration of low value cargo. The share in demand for manufactured articles in seaborne trade between Canada and China will be affected as a direct consequence of changes in the geographic pattern of production resulting from the Free Trade Agreement between Canada and United States. Sea transport of Chinese general cargo will meet competition from 1) alternative modes of transport, 2) commodity production within North America, and 3) redistribution of shipments between ports.

5.3 Geographic distribution

The geographic distribution of seaborne trade was strongly focused in 1987 on the Canadian west coast which accounted for 93% of the cargo tonnes handled with China, with Prince Rupert and Vancouver holding the leading position, while the share of east coast Canadian ports amounted to 7%, mostly at Halifax and Montréal. Future changes in production patterns will probably show a continual concentration of shipping to and from the western part of Canada. But more insight may be gained by identifying the location patterns of individual ports. The objective is not to predict the changes in China trade through its level of dependence on the Canadian foreland but to understand the foreland profile.

6. PRELIMINARY RESULTS

The Canadian foreland of China provides an excellent illustration to test the equation. First, table 4 reveals that, the foreland index of each Canadian port can be clearly measured. The sum represents the level of the Canadian foreland within the total seaborne trade foreland of China. The equation is an effective measure giving a good disaggregated data for each port.

TABLE 4

THE CANADIAN FORELAND OF CHINA, 1987

PORT	LOCATION	CARGO TONNES HANDLED	CARGO TONNES HANDLED WITH CHINA	FORELAND INDEX
Prince Rupert	British Columbia	13 100 373	2 760 069	0.0198
Thorold	Ontario	261 423	28 912	0.0104
Port Mellon	British Columbia	189 805	20 929	0.0104
Crofton	British Columbia	930 481	90 435	0.0091
Woodfibre	British Columbia	141 393	12 401	0.0082
Corner Brooks	Newfoundland	295 325	21 952	0.0070
Gold River	British Columbia	243 367	16 469	0.0064
Vancouver	British Columbia	60 280 333	3 980 318	0.0062
Ladysmith	British Columbia	286 532	13 877	0.0046
Valleyfield	Québec	191 662	9 161	0.0045
Trois-Rivières	Québec	1 331 687	56 567	0.0040
Tahsis	British Columbia	201 193	7 315	0.0034
Watson Island	British Columbia	247 040	7 928	0.0030
Squamish	British Columbia	953 126	25 920	0.0026
Botwood	Newfoundland	334 008	8 620	0.0024
Port Alberni	British Columbia	668 933	10 581	0.0015
Kitimat	British Columbia	2 294 450	27 101	0.0011
Port Hawkesbury	Nova Scotia	1 803 624	20 640	0.0011
Toronto	Ontario	887 714	10 568	0.0011
Halifax	Nova Scotia	11 452 135	106 469	0.0009
Nanaimo	British Columbia	1 361 287	12 726	0.0009
Thunderbay	Ontario	3 476 862	27 272	0.0007
Baie Comeau	Québec	3 125 536	24 424	0.0007
Montréal	Québec	14 065 415	87 205	0.0006
Port Alfred	Québec	3 061 439	16 001	0.0005
Campbell River	British Columbia	836 035	4 516	0.0005
Saint John	New Brunswick	11 138 743	52 314	0.0004
Dalhousie	New Brunswick	705 736	2 904	0.0004
Victoria	British Columbia	755 266	2 108	0.0003
Port Cartier	Québec	18 436 881	37 571	0.0002
Powell River	British Columbia	300 352	600	0.0002
Sarnia	Ontario	3 647 038	3 247	0.0001
New Westminster	British Columbia	1 852 957	2 179	0.0001
TOTAL		158 858 151	7 509 299	0.1133

Source: Statistics Canada, 1989

Secondly, as would be expected, many ports of British Columbia are clustered at the highest level of the index. The most important Canadian ports score relatively high on the index. Both Prince Rupert and Vancouver are within the first quartile (Map 3).

Thirdly, there seems to be an inverse relationship between size and the level of foreland. Indeed, many of the Canadian ports scoring high on the index handle less than 1 million tons per year (Map 4). An examination of commodity composition at each port reveals that individual Canadian commodity producers have integrated specialized sea transport services.

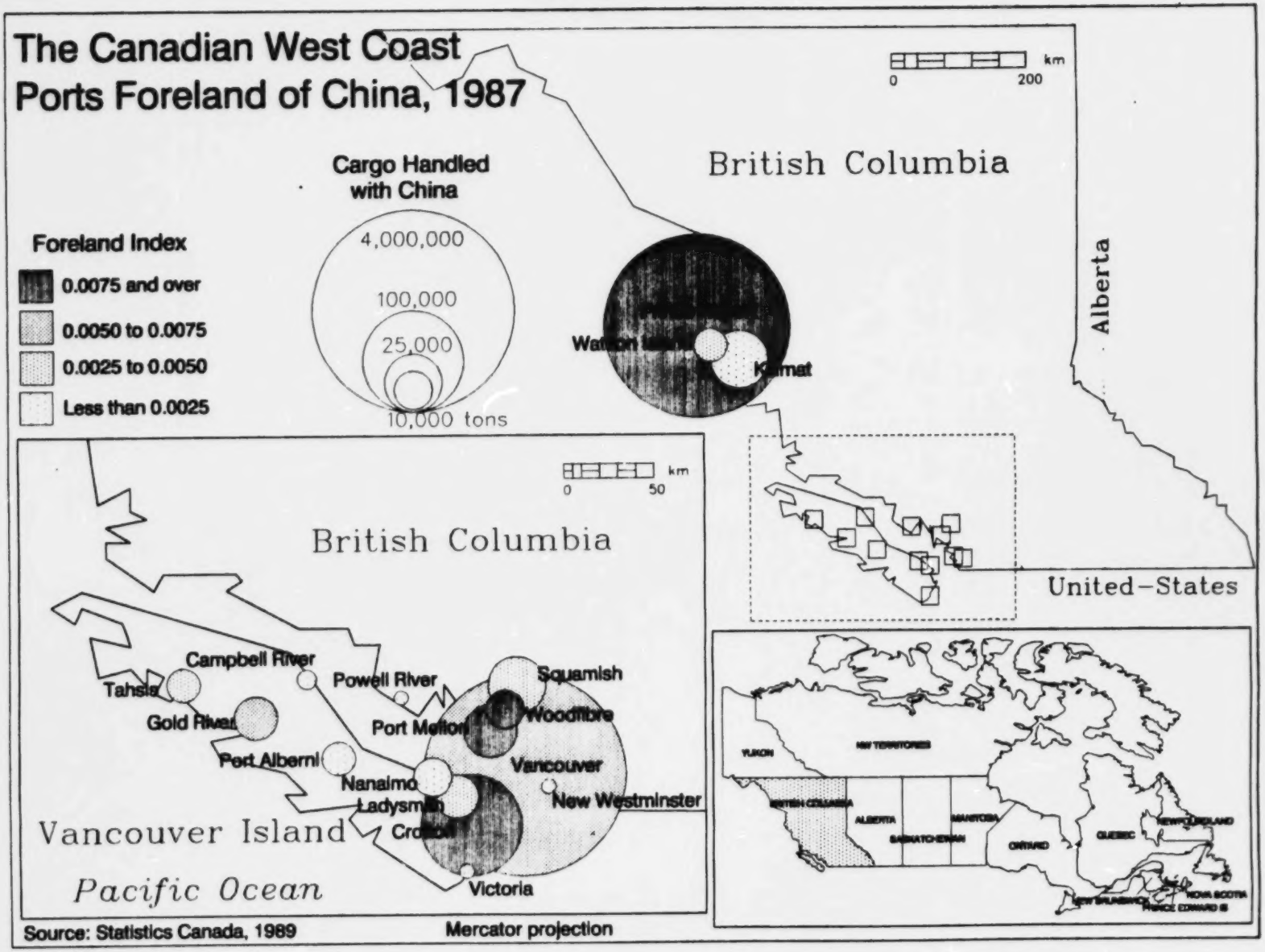
7. INVESTMENT STRATEGY

The observation about the Canadian foreland of China seaborne trade reveals the significance of Canadian transport readjustment for Chinese seaport investments. The international economy brought China into the world trade and production circuit. Ports are not ends by themselves but are means at the disposal of national economies. Their usage opens up remarkable possibilities, but the decision to create maritime industrial development areas originates from processes over and above the maritime transport sector. China does not have the general and major infrastructures that would permit sufficient redevelopment of ports. Particularly serious is the gap in the enormous investments involved in containerization, intermodality and port development.

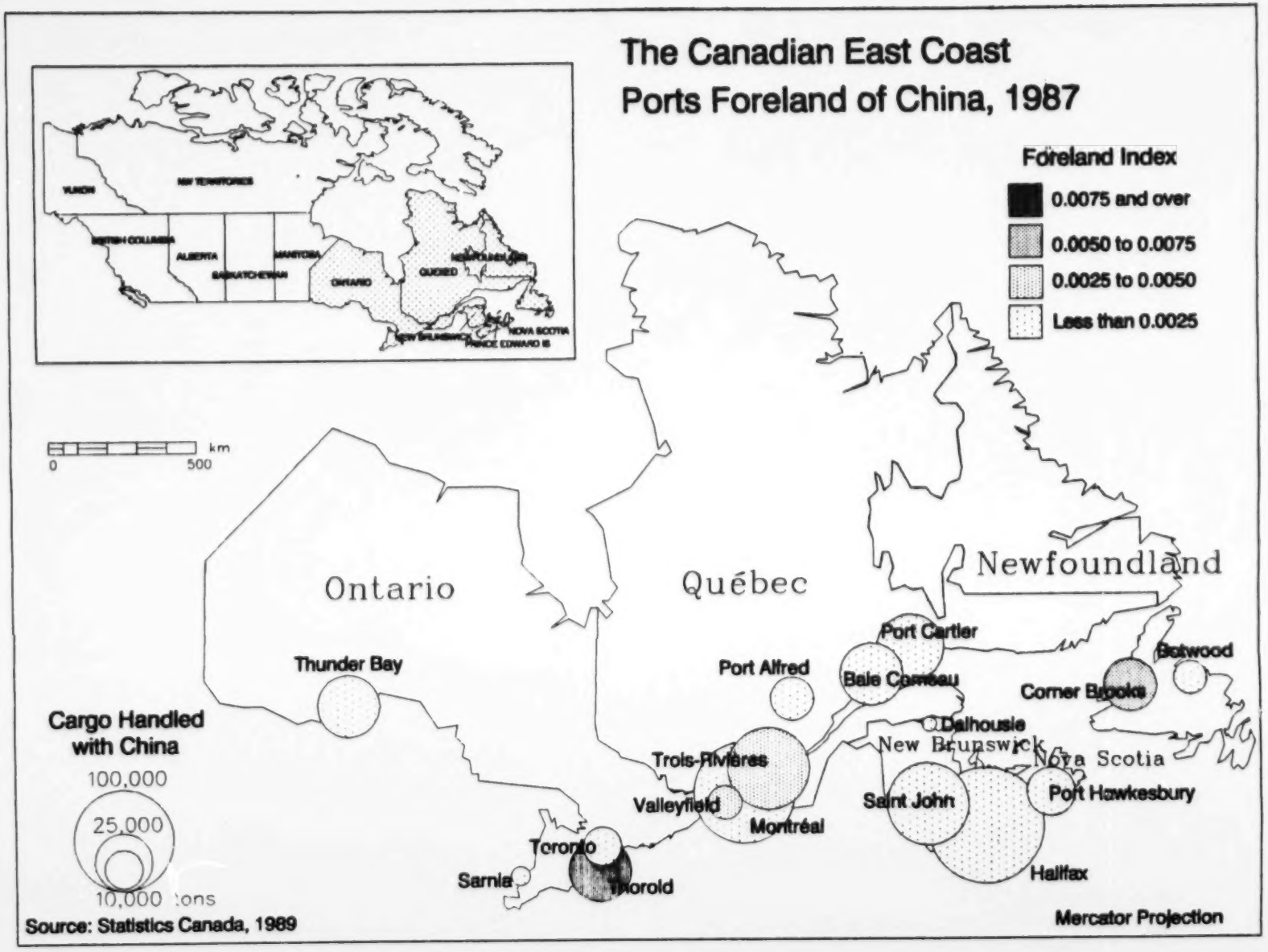
The unitization of general cargo by containerization enables the establishment of door-to-door services. Containerization has brought profound transformations in freight structure and many ports are losing the comparative advantage of site. Seaports in China have developed because of the key position they occupy on the coast or more particularly at the mouth of major rivers. The increasing transformation of China's economy have stimulated the transit function of the seaports where inland waterways have the necessary infrastructure to deal with the traffic which passes through the seaports. Shanghai is the most important port-city of China. The Chinese authorities are planning to make of Shanghai the most important commercial and financial center of the western Pacific (Comprehensive Plan of Shanghai, n.d.). The most important route for shipping between east and west China is the Changjiang that allows for deep sea traffic. The introduction of regular container services for Changjiang deep sea traffic linked with the increase participation of inland provinces into the world trade not only will affect Shanghai, but suggests that there are no guaranteed hinterland market for a given port.

The Chinese authorities are trying to coordinate investments in the rail, water and road transport. But there are difficulties in establishing criteria for the evaluation of relative investments in intermodality. The development of intermodal transport chains linking rail, road and water transport has modified the role of transport modes. Like other modes of transport, seaports will be affected by the movement towards combined traffic. The mouvement of container will increase. If the quality of ports and the potential of freight transport determine a port position on the maritime transport route, the forwarding means and services must be efficient. This is particularly true in the case of road transport whose potential interest in serving ports must be underlined. For example, 72% of the freight traffic in Shanghai is carried on

MAP 3


The Canadian West Coast
Ports Foreland of China, 1987
km
0
200
British Columbia
Cargo Handled with China
4,000,000
100,000
25,000
10,000 tons
Foreland Index
0.0075 and over
0.0050 to 0.0075
0.0025 to 0.0050
Less than 0.0025
Alberta
Kitimat
km
0
50
British Columbia
United-States
Campbell River
Tahsis
Gold River
Powell River
Port Alberni
Port Mellon
Squamish
Woodfibre
Vancouver
Nanaimo
Ladysmith
New Westminster
Victoria
Vancouver Island
Pacific Ocean
YUKON
NW TERRITORIES
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
NOVA SCOTIA
PRINCE EDWARD IS
Source: Statistics Canada, 1989
Mercator projection

MAP 4


The Canadian East Coast
Ports Foreland of China, 1987
Foreland Index
0.0075 and over
0.0050 to 0.0075
0.0025 to 0.0050
Less than 0.0025
YUKON
NW TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
NOVA SCOTIA
NEW BRUNSWICK
PRINCE EDWARD IS
km
0
500
Ontario
Québec
Newfoundland
New Brunswick
Nova Scotia
Thunder Bay
Port Alfred
Port Cartier
Baie Comeau
Botwood
Corner Brooks
Dalhousie
Trois-Rivières
Valleyfield
Montréal
Saint John
Port Hawkesbury
Toronto
Sarnia
Thorold
Halifax
Cargo Handled with China
100,000
25,000
10,000 tons
Source: Statistics Canada, 1989
Mercator Projection

roads. The relationship between road and water transport is facing several constraints in China that prevents the cooperation between the two modes. The constraints are essentially technical, that is major deficiency is observed in forwarding due to the inadequacy of road infrastructure. The major ports of China will have to be more containerized, of various dimensions and more efficient. The efficiency of a port will depend directly on terrestrial and fluvial transport of the hinterland. Roads will continue to play an increasing role. Indeed, the choice of forwarding will be done more and more at an Asian Pacific level. The maritime carriers will have to define at that level a strategy of grouping for ship building, intermediates, producers and distributors. This will compel countries bordering the Pacific to organize themselves and constitute alliances with a view to regroup their interests. China will have to seriously consider 1) how the management of flows between circulation nodes can be delegated, while the high value added services would be exercised at the convergence of brake-up load points and nodal traffic points, and 2) how some Chinese ports could be placed at the convergence of information flows and goods transformation, while others be transit key points of import and export flow between the country and the world market. This should bring authorities to think in terms of Asian Pacific networks, indeed inter-continental, since they are the networks that will progressively develop at the dawn of the third millennium.

The problem of seaports expansion particularly affects China where huge undertakings are in a majority. The question remains as to how to coordinate investments in transport infrastructures and particularly in seaports infrastructures? In China, investments for improving water transport infrastructures have been undertaken at the provincial level. To serve effectively China's maritime transport, each port cannot operate independently. The role of the state in relation to port development within a planned economy is much more direct since the state itself holds a monopolistic position creating investments funds and controlling their application. The competition that exists among Chinese ports and with foreign ports increases port investments notably in maintenance and functionning. But the size of transport investment to be realized presents problems. A possible point of departure would be investment determination on an individual basis. The new burden that will weigh on the Chinese state will bring the authorities to rethink the financing of port infrastructures. They will have to consider increasing the financial responsibility and the choice of infrastructure in port cities within a decentralization process. China will be then be able to forecast harbor installations adapted to demand of harbor traffic and the payment of infrastructure in relation to the competitivity of local industries.

The competitivity of Chinese seaports will be closely related to information equipment and personnel formation. Immaterial investment in research and development, in the formation and the organization of chinese transport must carry the same weight as material investment. The objective is to make appropriate and optimal use of facilities.

8. CONCLUSION

The above observations about seaports is justified because of China's foreland territorial transformations. All this reality points to the need for flexibility and adaptability to changes. It is a characteristic that can be

built into multipurpose ships, multipurpose ports, and the organization of trading enterprises (Fleming, 1978). If China is to transform its economy and build up internal capacity for continued self-sustained growth, it will be able to do so only with certain restraints. The new infrastructure will lay a new basis that might not be beneficial given the world rapid transformation. Given China's seaborne trade connections, the study of the Canadian foreland of Chinese ports is part of an undertaking that certainly deserves to be thoroughly detailed.

9. REFERENCES

Alexandersson, G. and Norstrom, G. World Shipping: an Economic Geography of Ports and Seaborne Trade. London: Wiley, 1963.

Armstrong, W. and McGee, T. Theatres of Accumulation: Studies in Asian and Latin American Urbanization. London: Methuen, 1985.

Berry, B.J.L. Essays on Commodity Flows and the Spatial Structure of the Indian Economy. Research paper no. 111. Chicago: Department of Geography, University of Chicago, 1966.

Bird, J. "Ports Then and Later" in Ports et mers. Mélanges maritimistes offers à André Vigarié. J. Charlier, ed, Caen: Paradigme, 1986, pp. 157-170.

Bisson, G.B. "Les conteneurs: où en est-on?" Portus, 2, 2 (1987): 40-41.

Charlier, J. (ed) Ports et mers. Mélanges maritimistes offerts à André Vigarié. Caen: Paradigme, 1986.

Chen, Nairuenn. Chinese Economic Statistics a Handbook for Mainland China. Chicago: Aldine, 1967.

Chen, Nairuenn. "An Assessment of Chinese Economic Data: Availability, Reliability, and Usability." In U.S. Congress. Joint Economic Committee. China: a Reassessment of the Economy. Joint Committee Print, 94th Cong., 1st sess. Washington, D.C.: Government Printing Office, 1975, pp. 52-68.

Chieng, A. and Chang Chongyang. Les nouvelles routes de la soie: l'art de commercer avec la Chine. Paris: Économica, 1987.

China Statistics Monthly, March 1989.

Comprehensive Plan of Shanghai. Shanghai: Bureau of Shanghai Urban Planning and Building Administration, n.d.

Comtois, Claude. "Transport and Territorial Development in China 1949-1985" Modern Asian Studies, (in print).

Croll, E. "The New Peasant Economy in China" in Transforming China's Economy in the Eighties, S. Feutchwang, A. Hussain, and T. Pairault eds, vol. 1. Boulder: Westview Press, 1988, pp. 77-99.

Delfs, R. "Discovered Drama in the Countryside" Far Eastern Economic Review, 131, 12 (1986): 81-82.

Fleming, D.K. "A Concept of Flexibility" Geojournal, 2, 2 (1978): 111-116.

Goldberg, M. The Chinese Connection: Getting Plugged into the Pacific Rim Real Estate, Trade and Capital Market. Vancouver: University of British Columbia Press, 1985.

Haulman, C. "Financial Innovation and the Chinese Enterprise" Journal of Northeast Asian Studies, 6, 2 (1987): 67-74.

Ho, S.P.S. and Huenemann, R.W. Canada's Trade with China: Patterns and Prospects. Montréal: The Canadian Economic Policy Committee of the Private Planning Association of Canada, 1972.

Hoare, A.G. "Geographical Aspects of British Overseas Trade: a Framework and a Review" Environment and Planning A 20 (1988): 1345-1364.

Leung Chi-Keung "Shipping and Port Development for Modernization" in Development and Change in China 2, E.D.K. Chen and S.S.K. Chin eds, Centre of Asian Studies Occasional Papers and Monographs, no. 46. Hong Kong: Centre of Asian Studies, University of Hong Kong, 1979, pp. 127-143.

Leung Chi-Keung and Comtois, C. "Transport Reorientation Towards the Eighties" in China in Readjustment, C.K. Leung and S.S.K. Chin eds, Centre of Asian Studies Occasional Papers and Monographs, no. 54. Hong Kong: Centre of Asian Studies, University of Hong Kong, 1983, pp. 216-233.

Li Chohming. The Statistical System of Communist China. Berkeley: University of California Press, 1962.

McCalla, R.J. "The Seaway: Rationale, Progress and Prospects" The Operational Geographer, 7, 3 (September 1989): 27-33.

Marcadon, J. "Le concept d'avant-pays marin: approche méthodologique" in Ports et mers. Mélanges maritimistes offers à André Vigarié. J. Charlier, ed, Caen: Paradigme, 1986, pp. 47-57.

Marcadon, J. L'avant-pays des ports français. Paris: Masson, 1988.

Maurer, J.-L. and Regnier, P. (dir) La nouvelle Asie industrielle: enjeux, stratégies et perspectives. Paris: Presses Universitaires de France, 1989.

Monro, J. M. "Transport as a Bottleneck in Chinese Economic Development" Paper presented at the Fifth World Conference on Transport Research, Yokohama, Japan July 10-14 1989.

Pannel, C.W. "Economic Reforms and Readjustment in the People's Republic of China and Some Geographical Consequences" Comparative International Development, 22, 4 (1988): 55-73.

Rabushka, A. The New China, Comparative Economic Development in Mainland China, Taiwan and Hong Kong. Boulder: Westview Press, 1987.

Sletmo, G. K. and Holste, S. China's Open Door and Shipping. Centre de recherche sur les transports, Université de Montréal, Publication no. 617, March 1989.

Stanley, W.R. "Some Geographic Trends in World Shipping" Geojournal, 2, 2 (1978): 147-162.

Stromme Svendsen, A. "The Concentration of Capital in Shipping and the Optimum Size of Shipping Companies" Geojournal, 2, 2 (1978): 163-174.

Statistical Yearbook of China 1981. Hong Kong: Economic Information and Agency, 1981.

Statistical Yearbook of China 1982. Hong Kong: Economic Information and Agency, 1982.

Statistical Yearbook of China 1984. Hong Kong: Economic Information and Agency, 1984.

Statistical Yearbook of China 1985. Hong Kong: Economic Information and Agency, 1985.

Statistical Yearbook of China 1986. Hong Kong: Economic Information and Agency, 1986.

Statistical Yearbook of China 1988. Hong Kong: Economic Information and Agency, 1988.

Statistics Canada, International Division. Imports by Commodity December 1987. Ottawa: Ministry of Supply and Services, Canada, March 1988.

Statistics Canada, International Division. Exports by Commodity December 1987. Ottawa: Ministry of Supply and Services, Canada, March 1988.

Tessier, J.M. and Dulude, M. "Ces préoccupantes négociations du libre-échange" Portus, 2, 1 (1987): 13, 15, 30.

Van den Bremen, W. J. "The Aggregate Spatial Patterns of Maritime Transport at World Scale: A Macro-scale Approach in Transport Geography" Geojournal, 12, 3 (1986): 289-303.

Van den Bremen, W.J. "Pacific Rim and Basin: Unity or Diversity?" Paper presented at the 26th International Geographical Congress, Sydney, Australia August 21-26 1988.

Vigarié, A. Échanges et transports internationaux. Paris: Sirey, 1987.

Wang, Jici and Bradbury, J.D. "The Changing Industrial Geography of the Chinese Special Economic Zones" Economic Geography, 62, 4 (1986): 307-320.

White, G. "The Impact of Economic Reforms in the Countryside: Towards the Politics of Social Capitalism" Modern China, 13, 4 (1987): 411-440.

Wong, C.P.W. "Interpreting Rural Industrial Growth in the Post-Mao Period" Modern China, 14, 1 (1988): 3-30.

Yeates, M.H. "A Note Concerning the Development of a Geographical Model of International Trade" Geographical Analysis, 1 (1969): 399-404.